REMARKS

Claims 1-2 stand rejected under 35 U.S.C. 102(e) as being anticipated by Adachi (Pub. No. US 2001/0038369). In response, Applicants amended claim 1 to incorporate the subject matter of claim 2, and respectfully traverse. Applicants traverse the rejection because Adachi does not teach a liquid crystal material having spontaneous polarization sealed between the substrates, as recited in amended claim 1.

Adachi is directed to a liquid crystal display device that includes a liquid crystal panel in a driving circuit. An object of Adachi is to provide the liquid crystal display with improved fall response characteristics, especially at at least a high-band level (Paragraph 0016). To achieve such a liquid crystal display, a liquid crystal layer of the liquid crystal panel may include a nematic liquid crystal material having a positive dielectric anisotropy (Paragraph 0026). Alternatively, the liquid crystal layer may be a homogeneous-orientation liquid crystal layer (Paragraph 0027). Adachi is silent with respect to a liquid crystal layer having spontaneous polarization.

In contrast, unlike Adachi, which is directed to improving the response speed of a liquid crystal display, the present invention provides a liquid crystal display that can be driven by a lower driving voltage, in which a liquid crystal material having a large spontaneous polarization is employed (see Applicants' specification page 5, lns. 5-8). As such, claim 1 calls for a liquid crystal display device that includes a liquid crystal material

having spontaneous polarization sealed between two substrates. As discussed in Applicants' specification, lns. 14-15, the liquid crystal can be formed of a ferroelectric liquid crystal.

In addition, Adachi does not teach a ratio of capacity of the storage capacitor verses that of the liquid crystal cell that is advantageously not less than 0.2 and not more than 5 for a liquid crystal display device that incorporates spontaneous polarization liquid crystal material, as recited in amended claim 1. Adachi merely discusses capacitance ratio in a nematic liquid crystal environment. More particularly, a ratio of not less than 0.2 in the present invention achieves an advantageous lowering effect of the driving voltage. That is, the driving voltage is lowered by not less than 10%. Moreover, the upper ratio of 5 limits problems with the liquid crystal display, such as a lowering effect of the driving voltage being saturated, which fails to obtain the lowering effect of the driving voltage even with an increased ratio (see Applicants' specification, page 12, lns. 6-15). Further adverse effects of an increased storage capacitance include deterioration in screen luminance due to a lowered aperture ratio, and an increase in power consumption. For all of these reasons, withdrawal of the §102 rejection of independent claim 1 is respectfully requested.

Claims 3-6, 9-13 and 20 stand rejected under 35 U.S.C. 103(a) as being obvious over Adachi, in view of Uchida (U.S. Patent No. 6,108,058). Applicants respectfully traverse the rejection because there is no motivation to combine the references to form a liquid crystal display having a liquid crystal material that has a spontaneous polarization sealed between two substrates.

Uchida is directed to a liquid crystal display that achieves a high resolution full color display without using any color filters. The Examiner states that Uchida teaches setting the data writing time on the liquid crystal cell and the storage capacitor through the switching element so that the amount of retransmitted light to the switching of the liquid crystal material determined by image data during an off state of the switching element does not substantially change, and is not more than 10 microseconds. However, Uchida does not teach that data writing time on a liquid crystal cell in the storage capacitor through the switching element is set so that the amount of transmitted light does not substantially change. While Uchida teaches that the data writing time is not more than 10 microseconds, Uchida teaches such a result so that the value is set in order to perform a refresh of two or more times in a display mode in which nematic liquid crystal is bend-orientated, so as to enable more accurate display of half-toned images. That is, Uchida is different from the present invention in the type of liquid crystal, the writing (i.e., driving) wave form, and the writing sequence.

The Examiner also suggests that the combination of Adachi and Uchida would achieve the spontaneous polarization liquid crystal material of the present invention, for example, that the liquid crystal material is a ferroelectric liquid crystal. However, the liquid crystal material utilized by both Adachi and Uchida is a nematic liquid crystal and not a ferromagnetic liquid crystal material. In fact, Uchida teaches away from using a ferroelectric liquid crystal material in a liquid crystal display by stating "...While a ferroelectric liquid crystal cell has a high response speed, it has some problems that half-tone images can be

hardly displayed, cell gaps should be made very thin and a troublesome orientation treatment is required." Accordingly, Applicants submit that one skilled in the art would not be motivated to combine the Adachi and Uchida references to form a liquid crystal display that includes a liquid crystal material having a spontaneous polarization. For these reasons, withdrawal of the §103 rejection of claims 3-6, 9-13 and 20 is respectfully requested.

Claims 7-8 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Adachi in view of Uchida, and further in view of Tagawa (U.S. Patent No. 5,534,892). Applicants respectfully traverse the rejection because there is no motivation to combine a simple matrix type liquid crystal display as disclosed in Tagawa with the liquid crystal displays of the Adachi and Uchida references.

Tagawa is directed to a display-integrated type tablet device. Tagawa teaches a liquid crystal display device that is a simple matrix type that has no switching element. Tagawa does not teach a liquid crystal display device of an active driving type which has a switching element in each pixel, as disclosed in the Uchida and Adachi references. Accordingly, since the structures of the liquid crystal display are completely different, there is no motivation to combine Tagawa with the other cited references. For this reason, withdrawal of the §103 rejection of claims 7-8 is respectfully requested.

Claims 14-19 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Adachi, in view Kaneko (U.S. Patent No. 6,151,004). Applicants respectfully traverse the rejection because the cited references do not disclose or suggest, among other things, a liquid

crystal display device that includes a liquid crystal material having spontaneous polarization sealed between two substrates.

As discussed above with respect to the rejection of independent claim 1, Adachi does not disclose or suggest using a spontaneous polarization liquid crystal material. Likewise, Kaneko uses a display device of a STN mode using nematic liquid crystal, unlike the liquid crystal display device of the present invention. That is, an advantage of the present invention is that a lowering in a driving voltage is achieved only when a liquid crystal material having spontaneous polarization is used. When a nematic liquid crystal having no spontaneous polarization is used, as in the cited prior art references, the driving voltage is not lowered even if a storage capacitor is provided. This is because the transmittance of the nematic liquid crystal is determined by the size of the applied electric field. That is, the storage capacitor can improve response, but does not affect transmittance. Since the amount of electric charge determines the transmittance of a liquid crystal material having spontaneous polarization, provision of a storage capacitor improves the transmittance and lowers the driving voltage. For these reasons, the present invention is distinguishable over the cited prior art references, and withdrawal of the §103 rejection of claims 14-19 is respectfully requested.

For all of the foregoing reasons, Applicants submit that this Application is in condition for allowance, which is respectfully requested. The Examiner is invited to contact the undersigned attorney if an interview would expedite prosecution.

Respectfully submitted,

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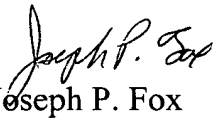
By 
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